CLAIMS

Sub a1

1. An optical inspection system for inspecting an object, comprising:

a plurality of cameras for imaging the object, each of the plurality of cameras being asynchronously triggerable;

an illumination system for providing a plurality of lighting modes to illuminate the object for the plurality of cameras;

a frame grabber unit for transmitting image data from the plurality of cameras to memory; and

a main computer for controlling image acquisition of the object,

wherein the plurality of cameras obtain image data of the object based upon a plurality of fields of view of the object and a series of firing positions within each field of view, each of the firing positions having associated therewith at least one of the plurality of cameras and a first one of the plurality of lighting modes provided by the illumination system.

2. The system according to claim 1, wherein a first one of the plurality of cameras can image a first location on the object in first and second ones of the plurality of lighting modes in a single pass over the object.

3. The system according to claim 1, wherein image data provided by the plurality of cameras is sent to the memory concurrently.

4. The system according to claim 3, wherein the memory is main memory that is directly accessible by the main computer.

5. The system according to claim 1, wherein the plurality of cameras includes at least four cameras.

6. The system according to claim 1, wherein the object is a printed circuit board.

7. The system according to claim 1, wherein the frame grabber unit includes a plurality of DMA channels for storing data in the memory, which is directly accessible by the main computer.

8. The system according to claim 1, wherein the frame grabber unit includes at least one image acquisition board having a plurality of DMA channels for transmitting image data from at least two of the plurality of cameras to the memory, which is directly accessible by the main computer.

9. The system according to claim 1, further including a movable head assembly to which the plurality of cameras are secured and a position encoder for providing position information of the head assembly.

10. The system according to claim 9, wherein a velocity of the head assembly can be adjusted to minimize inspection time of the object.

11. The system according to claim 1, further including event memory for storing firing position data, camera trigger data, and lighting mode for each of the plurality of firing positions.

12. An optical inspection system for inspecting an object, comprising:

a plurality of triggerable cameras for imaging the object;

an illumination system for providing a plurality of lighting modes to illuminate the object for the plurality of cameras;

a main computer coupled to the plurality of cameras and the illumination system;

a frame grabber unit for receiving image data from the plurality of cameras,

wherein the frame grabber unit includes at least one image acquisition board having a plurality of channels for transmitting image data from at least two of the plurality of cameras concurrently to main memory, which is directly accessible by the main computer.

13. The system according to claim 12, wherein a first one of the plurality of cameras can image a first location on the object in first and second ones of the plurality of lighting modes in a single pass over the object.

14. The system according to claim 12, wherein each of the plurality of channels corresponds to a DMA channel.

15. The system according to claim 12, wherein main memory can store image data for more than one stripe.

16. The system according to claim 12, wherein the object is a circuit board.

17. A method of inspecting a circuit board, comprising:

selecting a speed for movement of a head assembly supporting a plurality of cameras with respect to the circuit board;

dividing the circuit board into field of views, each of which includes a plurality of firing positions;

for each of the plurality of firing positions, selecting at least one of a plurality of asynchronously triggerable cameras and a first one of a plurality of lighting modes, wherein a first location on the circuit board can be imaged by a first one of the plurality of cameras in second and third ones of the plurality of lighting modes; and

transmitting image data from the plurality of cameras to memory.

18. The method according to claim 17, further including minimizing an inspection time of the circuit board from the head assembly speed, a number of lighting modes, and a number of passes over the circuit board required to image the circuit board.

19. The method according to claim 17, further including transmitting the image data to main memory that is directly accessible to a processor for analyzing the image data.

20. The method according to claim 19, further including transmitting the image data over a plurality of DMA channels.

21. The method according to claim 20, further including transmitting the image data from a plurality of cameras concurrently.

22. The method according to claim 17, further including imaging the circuit board in one pass over each stripe of the board, wherein at least one location on the board must be imaged in at least two different lighting modes.

23. A method of manufacturing a circuit board, comprising:

fabricating a printed circuit board;

populating the circuit board with components;

soldering the components to the circuit board to provide a circuit board assembly;

inspecting the circuit board assembly by

selecting a speed for movement of a head assembly supporting a plurality of cameras with respect to the circuit board;

dividing the circuit board into field of views, each of which includes a plurality of firing positions;

for each of the plurality of firing positions, selecting at least one of a plurality of asynchronously triggerable cameras and a first one of a plurality of lighting modes, wherein a first location on the circuit board can be imaged by a first one of the plurality of cameras in second and third ones of the plurality of lighting modes; and

transmitting image data from the plurality of cameras to memory.